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ABSTRACT

Collaboration in the classroom was studied using the Web of Intersubjectivity (L. Albert and others, 1999), a model of collaboration, and the concept of intersubjective inquiry was developed and explored. This study represents the third phase of an ongoing research project. In the first phase, researchers identified the Web of Intersubjectivity and intersubjective inquiry. In the second phase, researchers applied the Web of Intersubjectivity in their professional practices, and phase 3 concerned the use of intersubjective inquiry as research tool to assess the Web of Intersubjectivity as a model to guide the development and support of collaborative groups in individual classrooms. Intersubjective inquiry is a combination of the components of a bootstrap group, as identified by Heron (1996) and the tenets of educational action research. Data sources for this study included recorded conversations, e-mail discussions, field notes, readings, and samples of student work. Pedagogical practices were studied with 84 college algebra students and reflections were studied with 7 graduate students in a Master's program in occupational therapy. Study findings support the use of the Web of Intersubjectivity as a metaphor for planning and modifying collaborative learning experiences at graduate and undergraduate levels. They also show the fluid nature of the Web construct and the usefulness of intersubjective inquiry. (Contains 41 references.) (SLD)

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Collaborative Inquiry of Learning Groups in College Settings

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Today educators are asked to work with a student population that includes a diversity of languages, ethnicities, socioeconomic classes, and disabilities. At the same time they are expected to ensure that their students meet higher academic standards and are prepared to work in collaborative environments. If they are to succeed in this daunting task, educators need to draw on a body of knowledge of collaboration in the classroom to determine what is effective and ineffective educational collaboration. In other words, they need to inform their experiential knowledge with knowledge of research and theory, and their knowledge of research and theory with experiential knowledge (Bilics, 2000; Leonard, 1998).

A new research model that reflected an approach to attaining a level of shared understanding of adult learning grew from an ongoing collaborative process of developing and applying the Web of Intersubjectivity[1]. We called this approach intersubjective inquiry (Albert, Bilics, Lerch, & Weaver et al., 1999; 2000, under review) to reflect the nature of our work. The first two phases concerned the development and application of the Web of Intersubjectivity. This current study is two-fold, involving both the examination of the Web of Intersubjectivity as a model of collaboration and the continued development of intersubjective inquiry as a method of research. See Figure 1 for a description of the phases that are involved in this line of research. Intersubjective inquiry emerged from research on the application of Vygotskian theory to adult learning. Coming from multiple perspectives we attempted to reach a level of intersubjectivity with respect to the role of Vygotskian theories in our different professional practices. As we developed our shared understanding of the practical applications of Vygotskian theories to adult learning through the use of the Web of Intersubjectivity, we realized we were progressing through a series of three recurring cycles: pre-research, committed action, and the intersubjective pursuit of knowledge (Albert et al., 1999; 2000; under review). See Figure 2 for cycles of Intersubjective inquiry.

This session has two layers: the study of collaboration in the classroom through the use of the Web of Intersubjectivity, and a description of intersubjective inquiry, a collaborative inquiry research method. First, working from current research on collaboration, we will examine the development and maintenance of collaborative learning groups in our classroom practices. We will identify factors that facilitated and hindered the collaborative process and relate these to existing research. Second, we will discuss the process of intersubjective inquiry and how we use it to inform the use of collaboration in our professional practices. As coresearchers and

[1] See (Albert et al., 1999; 2000; under review) for a detailed explanation of the development and application of the Web of Intersubjectivity.

cosubjects, we have been involved with intersubjective inquiry for the past four years. We will describe the processes through which we made meaning and determined subsequent actions. Our discussion will provide a greater understanding of how to successfully use collaborative learning groups in classrooms and will encourage other educators and researchers to incorporate intersubjective inquiry into their practices.

PHASE I* September 1997 to April 1999	PHASE II** May 1999 to April 2000	PHASE III May 2000 to April 2001
♦ Explore Vygotskian and Neo-Vygotskian theories for adult learning ♦ Develop proposal for AERA 1999 ♦ Develop the Web of Intersubjectivity as identified in discussions	♦ Collaborate on paper based on presentation ♦ Research the Application of Web of Intersubjectivity in individual professional practices ♦ Develop proposal for AERA 2000	♦ Develop Intersubjective research model ♦ Further develop collaboration ♦ Develop proposal for two sessions at AERA2001

* Adapted from (Albert et al., 1999) ** Adapted from (Albert et al., 2000)

Figure 1. Phases of Intersubjective Inquiry.

Importance of Study

Collaboration is frequently suggested as a strategy for classroom learning (Johnson & Johnson, 1990; Moll, 1990; Sharan & Shachar, 1988; Slavin & Madden, 1995; Tudge, 1990; Vygotsky, 1978; Wells, 2000) and faculty development (Fullan & Hargreaves, 1992; Lieberman, 1995; Sarason, 1995). Collaboration refers to a group problem solving process that involves shared goals, resources, and authority (Kagan, 1991; Kagan, 1992). Unfortunately, it is a complex and poorly understood process (Fullan, 1999). Few researchers have attempted to understand the numerous factors that can influence the successful implementation of collaboration (Bilics, 1998; 2000; Johnson & Johnson, 1990; Newmann & Wehlage, 1995). This study will attempt to further our understanding of collaboration in all its complexity.

The development of a body of knowledge through research is a critical task for any profession. For a profession's research to be valued and respected by other professions, it must meet identified standards for rigor. The research that educators conduct as part of their practice must meet these standards for rigor. Intersubjective inquiry is a tool that provides a collaborative method of research for practicing educators to contribute to the body of knowledge related to collaboration, curriculum and instruction, and teacher and other professional education.

Working within the tenets of hermeneutic phenomenology, we believe that we must locate our research within our own experiences (Heron, 1996). Only through our shared

experiences can our interpretations have a validity and authenticity that is developed from within the experience rather than imposed on the experience (Bray, Lee, Smith, & Yorks, 2000). Practicing educators can locate their research in their experiences, developing a body of knowledge that can provide an inside perspective in contrast to research conducted by outsiders.

Phase I* September 1997 – April 1999	Phase II** May 1999 – April 2000	Phase III May 2000 – April 2001
Cycle 1 – Pre-research ♦ Define topic ♦ Pursuit of knowledge ♦ Collaborative dance	**Cycle 1 – Pre-research** ♦ Define topic ♦ Outline plan	**Cycle 1 – Pre-research** ♦ Define topic ♦ Exploration of learning ♦ Identify problems inherent in collaboration ♦ Building relationships ♦ Reflection on prior phases
Cycle 2 – Committed Action ♦ Identification of product ♦ Decision to become research group ♦ Method of research developing ♦ Data collection procedures established ♦ Outcomes defined	**Cycle 2 – Committed Action** ♦ Identification of product ♦ Intersubjective inquiry ♦ Application of Web of Intersubjectivity ♦ Data collection procedures identified	**Cycle 2 – Committed Action** ♦ Identification of product ♦ Application of intersubjective inquiry ♦ Data collection procedures identified ♦ Reflection on research focus ♦ Reflection on collaborative dynamics
Cycle 3 – Intersubjective pursuit of knowledge ♦ Collaborative process ♦ Group understandings ♦ Analysis procedures defined ♦ Formalization of method ♦ Reflection	**Cycle 3 – Intersubjective pursuit of knowledge** ♦ Collaborative process ♦ Analysis procedures defined	**Cycle 3 – Intersubjective pursuit of knowledge** ♦ Collaborative process ♦ Individual analysis ♦ Group analysis ♦ Reflection on current cycles

*Adapted from (Albert et al., 1999). ** Adapted from (Albert et al., 2000)

Figure 2. Cycles of Intersubjective Inquiry.

As two of the original four researchers who collaborated in a three-year research project[2], we will take a Vygotskian approach and acknowledge our historical roots. We joined the ranks of non-traditional adult students when we began pursuing graduate studies in our forties and also embarked on new careers in academia. We bring diverse professional perspectives to our research, including previous teaching at both elementary and secondary levels, and providing occupational therapy in schools, home health care agencies, and mental health facilities.

[2] See **(Albert et al., 1999; 2000)** for a detailed explanation of the work of Phases I and II.

Currently, we are faculty teaching occupational therapy at the graduate level in a state college and mathematics at the undergraduate level at a private, technical college.

In developmental and introductory college level mathematics students have a learning history replete with positive and negative experiences that affect how they perceive themselves as students of mathematics. We suggest that intersubjective inquiry provides the methodology, and the Web of Intersubjectivity the tool, to assess the planning and delivery of collaborative instructional activities for the adult learner. They also provide a framework to assess the effectiveness of different types of collaborative learning groups.

Occupational therapy professional education is preparing future occupational therapists for a changing health care environment, one in which they will be expected to continuously justify the efficacy of occupational therapy through research. In addition, they may be expected to participate in collaborative research or other collaborative efforts in future practice settings. Few students have participated in research, yet alone collaborative research, prior to their professional education. If they are going to incorporate research, or participate in collaborative research as part of their professional practice, they must experience it as part of their professional education. We propose that intersubjective inquiry and the Web of Intersubjectivity are tools that allow us to facilitate collaborative research and other collaborative activities in our classrooms and to assess experiential learning environments that facilitate the incorporation of research and collaboration into our professional practice.

Rigorous research is necessary for the continuing development of the teaching profession. Gibboney (1994) suggests that "education is an intellectual and practical enterprise" (p. 203-4, emphasis in the original). We propose that intersubjective inquiry is a collaborative research method that allows practitioners at all levels of education to examine the intellectual and practical aspects of collaborative learning in a rigorous and authentic manner. In addition, we propose that the Web of Intersubjectivity is a model that allows us to facilitate collaborative learning experiences within our courses.

Method: Intersubjective Inquiry

This study is Phase III of an ongoing research project. During Phase I of the research, September 1997 to April 1999, the researchers identified the Web of Intersubjectivity and intersubjective inquiry (Albert et al., 1999; under review). The focus of Phase II, May 1999 to April 2000, involved the application of the Web of Intersubjectivity in our various professional practices (Albert et al., 2000). The purpose of Phase III concerned the use of intersubjective inquiry as a research tool to assess the Web of Intersubjectivity as a model to guide the development and support of collaborative groups within our individual classrooms.

Intersubjective inquiry is a combination of the components of a bootstrap group, as identified by Heron (1996), and the tenets of educational action research as described by Elliott (1991) and Noffke (1995). Heron's bootstrap group was so named because of the action of the group members "pulling themselves up by their bootstraps" (Heron, 1996) into a cooperative research group. The bootstrap group would have already been formed, pursuing a previously identified collaborative venture. During the collaborative process, the bootstrap group would have identified the need to research a particular topic, thus adding a new focus to the collaboration. One of the advantages of such a self-generating group is that each member has an equal voice in the creation, direction, and maintenance of the research plan. The participants "are personally engaged with the culture or practice which the research is about, and this means they can be full cosubjects" (Heron, 1996, p. 40).

Intersubjective inquiry encourages the coresearchers' pursuit of knowledge about their various professional practices. Bray et al. (2000) and Cochran-Smith and Lytle (1993) concur with Feldman and Atkin (1995) when they state that by "focusing on their own practice, teachers can be thought of as 'subjects' of their own research, [and that] this research is self-developmental" (p. 128). By reflecting on those events and taking action, "the teacher has gained insight, a new perspective, a different understanding of her educational situation. She knows more about teaching, as well as how and what she wants to teach. She has become wiser about her practice" (p. 135).

Three distinct cycles have emerged in the previous use of intersubjective inquiry. Cycle 1 involves the pre-research stage where the topic is defined by the coresearchers. It is during Cycle 1 that the collaborative dance begins, where individuals form a group with a single purpose (Albert et al., 1999; under review). As Moustakas (1990) states, the opening conversations suggest "self-dialogue, [or] an inner search to discover the topic and question" (p. 27), indicating that each individual has an equal voice in establishing the goals of the research.

Cycle 2 encompasses the committed action, which involves the data collection itself. The plan derived through Cycle 1 is put into effect. During Cycle 2, the coresearchers come together frequently to share their thoughts on the differences as well as the commonality of their data. Coresearchers may come from different environments to explore the "similarities and differences in their several modes of practice" (Heron, 1996). Since dialogue is open and ongoing, trust is developing between the participants, a necessary component of intersubjectivity. As Heron stated,

> The fullest form [of inquiry] means that the inquirers are working together in the action as well as in the reflection phase. This allows for the maximum amount of influence between reflection and action. This influence can occur within each person, and also

between people in terms of feedback to another on their action, and learning from the action of the other. The full form also includes inquiries where each person does the action phase on their own away from the group. (p. 410)

It is during Cycle 3 that the pursuit of intersubjective inquiry becomes a primary goal of the coresearchers. Common understandings are reached through the use of shared space, time, and dialogue (Albert et al., 1999; under review; Bilics, 2000). Trust and respect allow for the development of a common knowledge base, where no one understanding takes precedence over another.

As educators, we are constantly striving for new insights to enhance our professional practice. By engaging in the research process and modifying activities in the classroom, we come to a different understanding of our educational situation. New insights often result in decisions to act in different ways (Feldman & Atkin, 1995), thus providing a goal for the research that is both immediate and purposive.

This study is Phase III of a larger study that began in the fall of 1997 (see Figure 1). Phase I of this study consisted of a series of planned conversations in which each of the original coresearchers developed a metaphor/picture of what Vygotsky's (1978) zone of proximal development meant to them (Albert et al., 1999; under review). These metaphors, in turn, led to development of the Web of Intersubjectivity, resulting from the combination of shared experiences, the theories of collaboration, and the Vygotskian and Neo-Vygotskian construct of socio-cultural learning and development. The application of the Web of Intersubjectivity in various professional environments was the focus of Phase II (Albert et al., 2000). The planning for Phase III drew on current research on collaboration while concentrating upon the development and maintenance of the collaborative groups created in our classrooms.

The data sources for Phase III of the study included transcripts of audiocassette conversations, email discussions, reflections, field notes, readings, and selected samples of our students' work. Since the primary goal of educational action research is "to become wiser about educational practice" (Feldman & Atkin, 1995, p. 130), we concentrated on the application of intersubjective inquiry to examine collaborative learning groups in our professional practices using the Web of Intersubjectivity. A few of the questions that guided our research were:

(a) How was intersubjective inquiry effective for developing and maintaining collaborative groups among peers?
(b) How did we use intersubjective inquiry to guide planning of our professional work?
(c) How has the Web of Intersubjectivity informed the development and maintenance of collaborative groups?

(d) How did we use the Web of Intersubjectivity to guide our educational practices?

Data Collection

This study had two levels of focus, our pedagogical practices and our reflections. The first focus, our pedagogical practices, occurred in two settings, in two disciplines, and at two levels of higher education. One part of the research was accomplished with undergraduates attending a small technical college with a student body of 550 students, eighty percent of whom are males. The students involved in this study were enrolled on two mathematics courses. The first course was a non-credit refresher course, Basic Algebra, and the second was College Algebra. There were a total of 11 students enrolled in one section of Basic Algebra while 73 students were enrolled in three sections of College Algebra. Of the 84 students, 14 were female and 70 were male, and 82 were Caucasian.

Students were asked to participate in online collaborative groups through threaded conversations about specific topics pertaining to their mathematics course. The online discussions were designed to provide an additional means of communication between the members of the courses. By extending the possibility of collaboration to the Internet, asynchronous learning groups would create an additional avenue for students to seek or receive extra help. Free peer tutoring is provided by the college in the Math and Science Learning Center on a drop-in basis, but it was hoped that the online groups would be an additional resource for the students to discuss issues with other members of their class. The software program WebCT (WebCT Incorporated, 2000) was adopted for the purpose of providing the location for threaded conversations, as well as the location of any print resources created for the individual courses. Syllabi, homework assignments, and the written requirements for extra credit work were posted on the WebCT homepage for each section of both courses. Students were able to access this material from all computer labs on campus as well as from their dormitory rooms through their personal computers.

The other part of the research was done with graduate students enrolled in a Master of Occupational Therapy (MOT) program at a state college with approximately 2700 undergraduate and graduate students. The students in the MOT program attend classes as a cohort, consisting of seven females ranging in age from their early twenties to mid-forties. The data for this study were from students' work in four classes, Research I and II, Professional Orientation, and Group Process and Theory.

Research I and II, occurring during the first and second semesters of their graduate program, prepares students to critically use research and to independently complete a Master's thesis. Research I provides an overview of quantitative and qualitative research design and

methods. Research II focuses on data analysis, standardized tests, and program evaluation. During the two semesters, the students collaboratively design and implement a phenomenological study and a descriptive quantitative study using survey data. Students are encouraged to do peer editing of their written work, which includes a research proposal, findings sections for both quantitative and qualitative data, and a research report for the phenomenological study.

Professional Orientation is the introductory course offered during the first semester. Students are new to the program, the college, and their peers. This course examines various aspects of the profession and also expects students to begin to develop the collaborative skills they will need as a practicing professional. Collaborative and individual projects were incorporated into the course. Early in the term, an in-class collaborative project was assigned: to develop a time line reflecting the history and development of the profession. The purpose of this project was to enable the students to develop an understanding of the profession's history, its philosophy, and the historical influences that contributed to its development. In addition, the project was intended to force the students to work together in a collaborative process, thus developing their team skills and the cohesiveness of the cohort.

Group Process and Theory is a second semester course that develops group leadership skills and increases the students' knowledge of group theory. In addition to readings, lectures, and discussions, students are expected to work in small groups to plan specific teaching-learning experiences and to plan and implement a functional group for their peers. Functional groups are based on the theoretical foundations of occupational therapy. Students are expected to reflect on their experiences as group leaders from a personal and theoretical, scholarly perspective.

The second focus of our study involved our reflections as both individuals and collaborative partners. Individual reflections were ongoing while collaborative reflections occurred intermittently. We engaged in both reflection-on-action and reflection-in-action (Schön, 1983; Schön, 1987). Our reflections focused on the experience of using the Web of Intersubjectivity to plan and modify learning opportunities in our classes. Through these reflections, we were able to determine the level of resonance among our levels of knowledge (Heron 1996, 1997). In addition, we reflected on the intersubjective inquiry process as it informed our practice. Guided by the analysis of these reflections, we reinforced or modified the Web of Intersubjectivity.

Analysis and Discussion

Two frameworks informed our analysis of data, the Web of Intersubjectivity and intersubjective inquiry. The Web of Intersubjectivity provided the framework within which we examined one layer of our findings, the use of collaborative learning experiences in our classes.

The Web of Intersubjectivity (Albert et al., 1999; 2000) informed our development of collaborative groups in our professional practices. Since collaboration requires some level of intersubjectivity among the participants in order to be successful, a working definition is introduced: intersubjectivity refers to the ability to reach a common understanding (Albert et al., 1999). This definition does not presume that all participants agree, just that they understand each other's position. The structure of the Web of Intersubjectivity itself guided our thinking as we planned, worked with, and assessed various class projects throughout the semester.

The Web of Intersubjectivity is a model based on a spider's web, where the frame and the large internal "Y-thread" form the support structure (Albert et al., 1999; 2000; Bilics, 1998). The spider begins the creation of the web with a "throw thread," anchoring the web to two external points. Next, the spider creates a loop that will form the internal body of the web. Once the external frame is created, a box-like structure that will bound the finished web, the spider drops a line to anchor this loop to the framework, thus forming a Y. Finally, the rest of the threads are spun in place, adding size and depth to the natural web.

The framework of the Web of Intersubjectivity is similar. A single "thread of collaboration" initiates the creation of the Web of Intersubjectivity, the reaching out process of collaboration (Albert et al., 2000). The Y-thread represents the problem situations that require collaboration. (See Figure 3.) We have struggled with how to define this "tension thread" that forms the base of the Y-thread (Albert et al., 1999; 2000). Initially, we felt that tension was necessary to create the need for reaching some level of intersubjectivity (Albert et al., 1999; 2000). Next, we realized that commitment was also a key component of building intersubjectivity, since without commitment to the process, there would be no progress toward higher levels of intersubjectivity (Albert et al., 2000). The strength of the Web of Intersubjectivity comes from the supporting structures of shared space, time, and dialogue, while the internal strength is found in the tension and commitment produced by the problem (Albert et al., 1999; Bilics, 1998; 2000).

The frame and the Y-threads of the Web of Intersubjectivity provide the key components of the model, and the additional internal threads provide the working components of the progress toward intersubjectivity. These threads are flexible parts of the entity in that they may assume a role of primary importance or secondary support, depending upon the situation. For example, when planning collaborative endeavors, it may not be as important to consider the development of collaborative skills with adult students as it is to consider power issues within the groups.

The Web of Intersubjectivity is also flexible in design, in that threads can be added as their need emerges from the application process. In our previous studies, we saw the need to

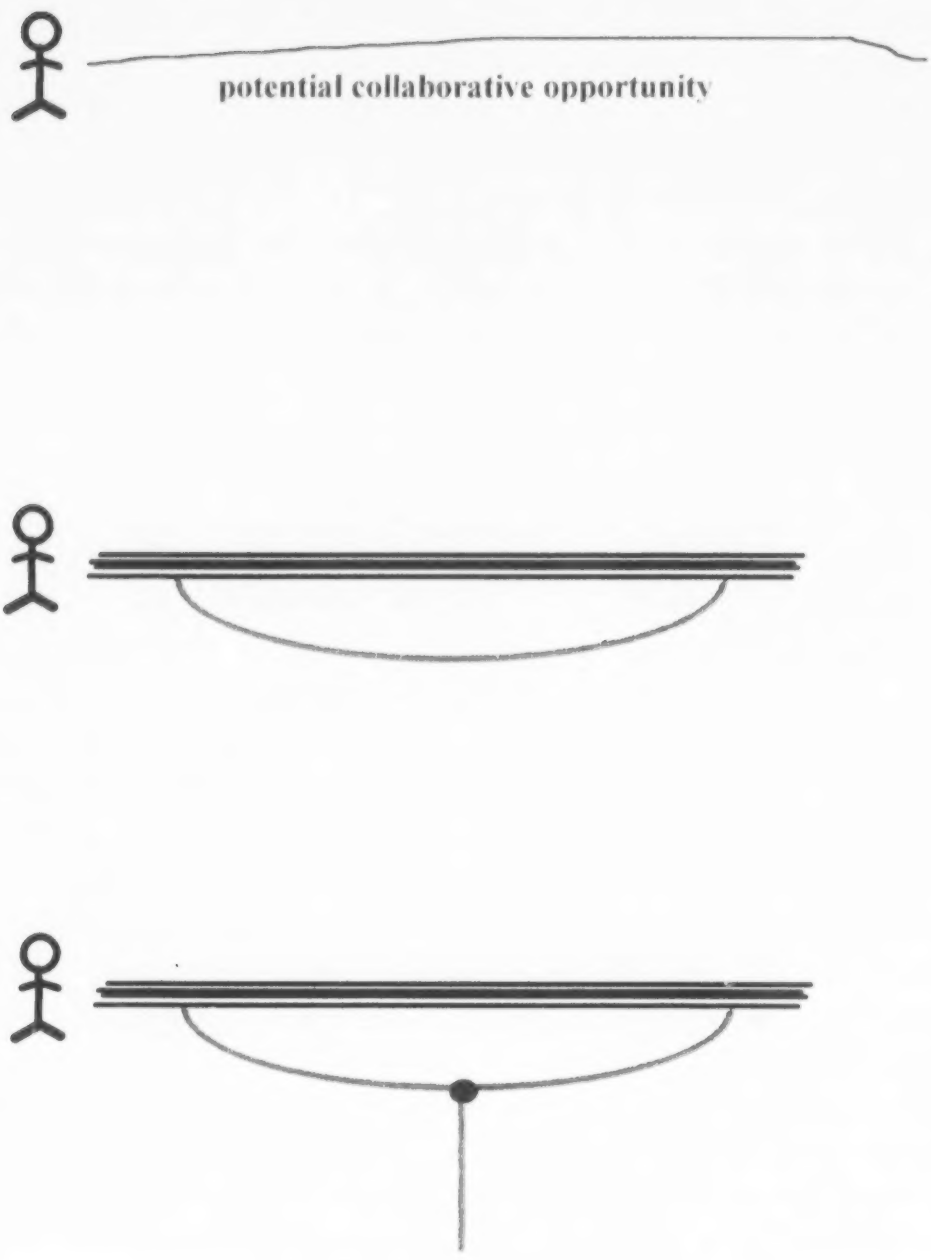

Figure 3. Establishing the Web of Intersubjectivity.

create two additional threads, those of knowledge and relationship, in our original Web of Intersubjectivity (Albert et al., 1999; 2000), (see Figure 4). We also realized that respect was a

unifying thread of primary importance in the development of intersubjectivity and added that as a spiral thread passing throughout the entire structure (Albert et al., 2000).

The other framework of our analysis was intersubjective inquiry. Inherent to this study was the daily work we engaged in as we used intersubjective inquiry and identified its implications for researching adult learning in various collaborative contexts. Our initial understanding of intersubjective inquiry supports educational action research. "Because action research must be embedded in what teachers are already doing and must match the temporal and spatial flow of teaching, it cannot rely on the methods of the natural or social sciences" (Feldman & Atkin, 1995, p. 136). We see intersubjective inquiry as a recursive process that corresponds to the teacher's reflections and actions in her classroom.

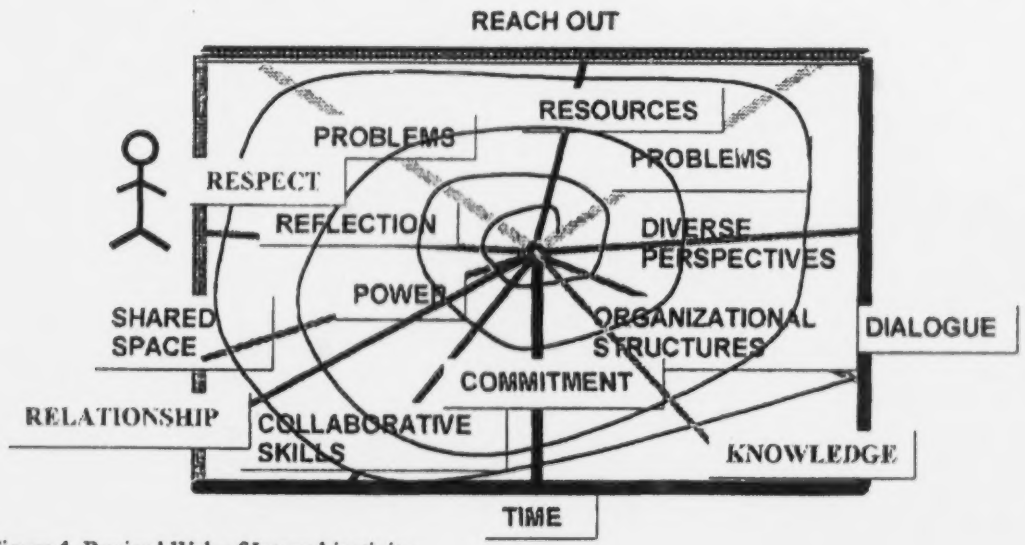

Figure 4. Revised Web of Intersubjectivity.

Intersubjective inquiry developed from our study of Heron. Heron's (Heron, 1997) "participative worldview" provides an epistemological framework for understanding our experiences in this collaborative self-study. A participative worldview maintains that reality is simultaneously subjective and objective and involves four levels of knowing: experiential, presentational, propositional, and practical (Heron, 1996; 1997). Intersubjective inquiry reflects Heron's levels of knowing. The levels of knowledge are seen as a pyramid with experiential knowledge the base and practical knowledge the top. Experiential knowledge reflects the experience of the person and includes emotions and connectedness with one's environment. Presentational knowledge is an attempt to classify and organize the world using metaphor,

images, and other non-language symbols. Propositional knowledge is grounded in language and contains theories and laws. This knowledge allows individuals to plan and project. Practical knowledge is action and intention. The pyramid forms a cycle. Each level of knowledge is grounded in the level below and informs the level above.

Heron's levels of knowledge form a dynamic cycle that allows individuals to continuously learn in relation to the environment in which they are functioning. This means that an individual experiences the world at a feeling level rather than simply existing in it. These experiences provide the experiential knowledge that is the foundation for all levels of knowledge. In an effort to make sense of this experiential knowledge, individuals develop presentational knowledge. They can use images, metaphors, or music to better express their knowledge. Gradually, presentational knowledge is more fully expressed using language. People develop models, theories, and laws to explain the world in which they live. They then develop propositional knowledge. When people intentionally use these models, theories, and laws to influence their world they have moved to the level of practical knowledge. The validity of practical knowledge depends on the experiences that formed the basis of images or metaphors that developed into theories or laws. The dynamic cycle becomes apparent as individuals reflect on their actions and subsequent results. In Heron's (1996) co-operative research, co-researchers proceed through the four levels of knowing, cycling back and forth many times, to deepen their understanding and intersubjectivity. Heron's four ways of knowing provided a framework for our analysis.

Findings

This study had two levels of focus, our pedagogical practices involving collaboration and our reflections on these practices. The findings that emerged were due to our use of the Web of Intersubjectivity to inform the collaborative processes in our professional practices. Further findings were based on our reflections of our process of intersubjective inquiry.

The Web of Intersubjectivity

One of the key components of the Web of Intersubjectivity is the existence of a problem to provide a foundation for the collaborative process. The importance of the problem became apparent in Carol's attempts to use asynchronous conversations. Asynchronous conversations take place over a period of time and from different locations (Ohlund, Andrews, Ho Yu, Jannasch-Pennell, & DiGangi, 1999). The threaded discussions may occur out of sequence, as can be seen in the chart provided in Figure 6. The purpose of the asynchronous cyber-groups was to

establish a learning community outside the classroom where the students would be able to ask questions of their peers, share information, and receive additional support through this new medium (Jonassen, 1998). Moller (1998) notes that asynchronous groups provide the students with a means to acknowledge the frustration they feel when working on difficult problems and to realize that their peers may also feel this same frustration. "The learner will likely understand that these feelings are typical and thus will be able to continue to work toward the educative goal" (p. 120).

Basic Algebra was taught in the computer lab and students had additional time to access WebCT (WebCT Incorporated, 2000). The students enrolled in the course were able to earn extra credit for their participation in creating threaded conversations. They were asked to sign up for a specific week when they would be responsible for the topic of the threaded conversations. All were encouraged to work with another member of the class, ensuring collaborative focus throughout the assignment. All students posted topics of discussion on the WebCT homepage, thereby earning extra credit to be applied toward their final semester grade. Fifty-three messages were posted to the WebCT bulletin board. Of these, eleven messages created new threads and the rest, forty-two, were responses that formed the threads of conversations that followed the specific topic started in the initial thread. See Figure 6 for a diagram that shows the relationship of the conversational threads. Each thread is numbered to show the order in which they were entered, dated to indicate when the comments were written, and initialed to indicate who wrote them. Asynchronous conversations can take place over a great deal of time, as can be seen by threads 18 and 19. In both of these threads, the initial comments were posted on September 9 and 11 respectively while the final replies were posted six weeks later on October 30.

The problem situation is an important aspect of threaded discussions. Correnti-Agostinho, Hedberg, and Lefoe (1998) stated that when they were establishing unstructured threaded conversations students lost interest and motivation if the problem task was not designed well. In the threaded discussions developed in the Basic Algebra course, the students were only briefly engaged in the posted topics. The attempt to develop a support network through asynchronous threaded conversations devolved into an interactive email situation. Students did respond briefly to various postings, but the new threads were only initiated as a result of their assignment to do so. None of the students saw this tool as a means to get, or give, additional support when faced with difficulties during the semester. The development of the problem is a key component of using such resources. The problem under discussion must be one that engages students in order to ensure their participation. One of the difficulties in this study was that the initial problems were important to me but not to the students, hence their engagement in the process was minimal.

One of the important aspects of asynchronous learning is the establishment of a sense of community and this did not happen with these students. They came together for their in-class sessions but did not develop a sense of class unity. The design of the classroom impacted their ability to interact with each other. The class was small enough that students could space themselves out around the room, with one student per computer. Only two pairs of students sat next to each other. The class rarely interacted as a single unit, thus when faced with Internet-based discussions, they had not established a pattern of discussion to develop a solution to a problem (Corrent-Agostinho et al., 1998).

The students in College Algebra were also asked to participate in online collaboration, but their participation was not organized as part of the class work. Very few of these students made use of the software to generate threaded discussions. Only one topic produced a "discussion" concerning the possibility for extra credit in the course. Time was not made available during class to promote use of threaded discussions as a collaborative tool, and so the students chose not to allocate a limited resource to an endeavor that was not deemed important.

Collaboration formed the basis of the in-class learning situations in the College Algebra course. This course had a very complex design, requiring multiple forms of interaction by the students on different topics throughout the semester. The course was comprised of three components supporting the weekly activities of the students. The first part was the lecture session, where the course material was presented. When time allowed, the classes formed collaborative groups to work on various in-class assignments. The second part of the course involved two-hour weekly recitation sessions where the students gathered to work on their mathematics assignments under the direction of adjunct faculty. The third component of the course involved application labs where students gathered with other students in their majors to work on applied mathematics problems. Carol taught the aviation labs while another mathematics faculty member taught the other applications labs.

Collaboration was integral to the design of this course. The students did work collaboratively both in and out of class on various assignments in both the regular classroom component as well as on their lab projects. By the use of the Web of Intersubjectivity to design specific in-class assignments, Carol was able to foster a sense of community among these first-semester students developed. The class sessions involved lively discussions on the mathematics topics of the day. Students were encouraged to seek support from each other when faced with a difficult mathematical problem. The laboratory assignments followed this design as well. Various problem situations that connected aviation theory and mathematics were posed and students were required to present their solutions to the class.

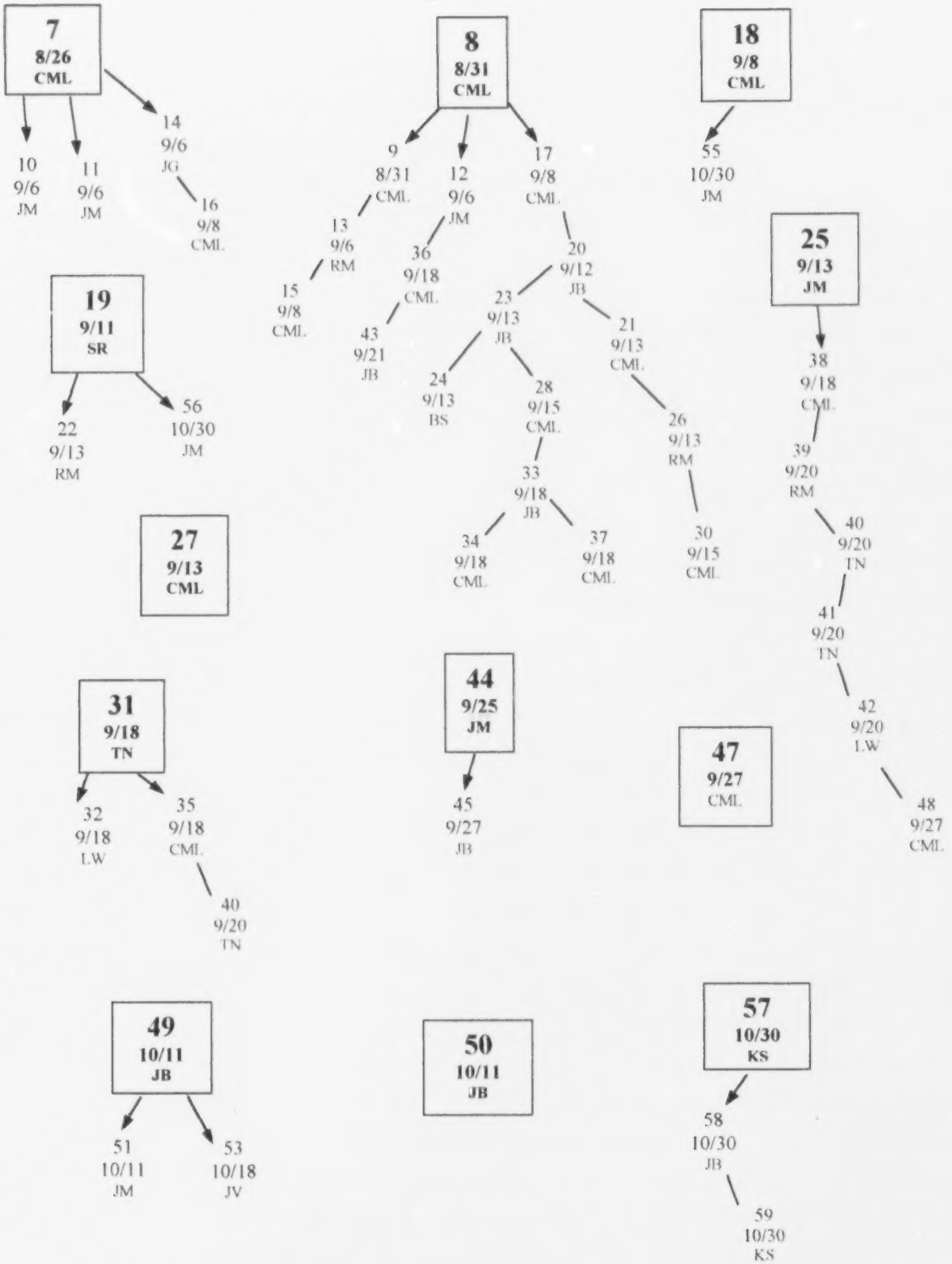

Figure 5. Threads of Conversation.

The importance of the problem was also evident in the planning for Professional Orientation, a first semester course intended to develop a basic understanding of occupational therapy's philosophical, theoretical, historical, and organizational foundations, and to develop collaborative skills. Using the Web of Intersubjectivity (Albert et al., 1999; 2000) as a framework, Andrea focused first on identifying the problem, the creation of a timeline reflecting the history of occupational therapy through which students would develop an understanding of their chosen profession's history and the factors that influenced its development. In order to accomplish the assignment, the students were forced them interact and to explore their relationships with each other, thus aiding in their need to develop a cohesive cohort. In order to support the collaborative problem solving process, Andrea first provided single copies of reading resources, which the students divided among themselves. By not having the students read the same material, she had ensured that each would have different, yet adequate resources that they would bring to the collaborative process. Next she allocated time within the class schedule to accomplish the task. Not only did this action provide valuable blocks of time, it also provided a shared space within which students could work. By providing time and space she clearly stated the importance of solving this problem, subsequently increasing their investment in the task. Last, by not rigidly defining the task and by dividing the reading materials, Andrea had forced the students to dialogue among themselves. They had to structure the task by identifying components of the timeline, clarifying how they would create the timeline, and negotiating various group roles.

The Web of Intersubjectivity provided us with a framework to structure a collaborative task early in the semester. The importance of the development of the problem was highlighted by the two examples above. In the first instance a poorly designed problem did not produce the desired collaboration. In the second instance, the provision of a significant problem initiated the development of collaboration. Our awareness of the Web of Intersubjectivity guided our planning for these situations. The students needed to come together with a joint focus in order to successfully accomplish the task. In the learning situations that produced heightened levels of collaboration, we also facilitated this process by allocating time and shared space, and enhancing dialogue by dividing resources and leaving much of the task unstructured.

In this study, we used the Web of Intersubjectivity to guide our practical knowledge. We carefully planned collaborative experiences, attending to key components of the Web. Through our reflections we were able to recognize when our experiences resonated with what the Web of Intersubjectivity predicted, and also when our experiential knowledge created the need for an explanation of a perceived phenomenon. For example, when we provided shared space, effective

problems, and sufficient time, we enhanced the functioning of collaborative groups. When we observed that collaborative groups were not functioning, we were able to use the Web of Intersubjectivity to identify how we could facilitate the process. In these situations we used the Web of Intersubjectivity to focus our attention on aspects of collaboration that we could manipulate. Finally, when collaborative groups were not functioning, we were able to identify additional factors that influenced the process and incorporated them into the Web of Intersubjectivity.

Through the above scenario we realized the physical environment influenced the collaborative process. Carol's College Algebra course this semester had her puzzled. The students would not form groups to work together during class, but would immediately form interactive groups during recitation sessions. The differences became very marked as the students began to work on their lab assignments. (The laboratory component begins in the eight week and continues once a week for the remainder of the semester.) The majority of students would come to the regular class and sit silently, neither responding to questions nor talking to each other, while in the recitation sessions, these same students would be involved in lively, interesting conversations, all but a few of whom would join groups to work on their mathematics.

Fall semester, all College Algebra classes were in regular classrooms with typical school desks. The students would come to class and move the desks together as soon as the problems of the day were posed. Spring semester, College Algebra met in a former computer classroom. The students sat in comfortable chairs at two-person tables. They only broke the rigidity of this structure once during the semester, no matter what Carol would do to encourage their intermixing. During the course of this semester she commented to the students on this dilemma, suggesting that the classroom design had an impact on how they worked. They assured her it did not have any effect, and suggested that she keep the classes in this room for next fall. They all liked the tables instead of desks but did not have any reason to account for the difference in their behavior.

College Algebra has split into three components for the last eight weeks of the semester: regular class, recitation, and lab. This semester Carol is also running the recitations. The students may work on any of their mathematics assignments during recitation and most are using that time for their aviation labs. The changes in their behavior from one type of session to another were so remarkable that Carol decided to turn to the Web of Intersubjectivity to see if she could find a reason for such differences in classroom conduct. The thread concerning Organizational Structures prodded her to think again about the design of the classroom. She returned to her original thought that the structural design of the classroom environment does impact student

interaction. In a room where one's individual space (represented by the desks) can be moved to merge with another's individual space, the students are willing to work together. In the classroom where space is defined as a unit (two-person desks), the students can meld into their individual space and block contact with the surrounding environment. Even though the desks and chairs are on wheels, the students do not move them away from the formal position of two people per table, with all tables facing front.

Carol thought about the lack of interaction in the Basic Algebra course last semester, and realized that the physical environment of that classroom also precluded students from forming groups. They would talk to the person next to them, but did not interact with anyone else. These two-person groups became a single unit, creating a personal space around the two that was much more resistant to outside interaction. This environmental design resulted in the combined unit being greater/stronger than the sum of its parts.

Andrea also turned to the Web of Intersubjectivity to enlighten her thoughts on collaboration in the Group Theory and Process course where students are expected to lead groups consisting of their peers. In a small class of seven, collaboration and leadership roles with multiple groups became impossible. As a result, Andrea found the assignment did not create a problem sufficiently challenging to facilitate collaboration among the students. Using the Web of Intersubjectivity, she focused on the need to develop a sufficiently challenging problem. Andrea identified specific goals for these new assignments: the experience of planning and implementing a group, and to subsequently conduct a scholarly analysis of the group process based on the students' observations as participants. In this situation she shared her power with the students in order to develop common goals for the group. Through dialogue they were able to agree on a sufficiently challenging problem to engage the students. Subsequently, she has supported the students' efforts with time, shared space, and resources, further enhancing the collaborative problem solving process.

The Web of Intersubjectivity has moved, for us, from a metaphor to a model. We were able to use the components of the Web to inform our work with collaborative groups. The flexibility and malleability of the Web of Intersubjectivity encourages the emergence of threads from secondary to primary status as situations warrant. Smaller, connecting threads may be emphasized as the Web of Intersubjectivity is used to inform the activities occurring in different situations. The changing status of the threads was apparent when we enhanced dialogue by diversifying the information resources, created a challenging problem, or shared power.

The flexible design of the model is also apparent when new threads may be added. These new threads strengthen its usefulness as a tool to create collaborative groups. Carol was

stimulated to think about the design of the physical space of her classrooms by reflecting on Organizational Structures, even though the actual physical environment is not part of this thread. Organizational Structures, identified in the original Web of Intersubjectivity, dealt more with the administrative aspects of the environment, for example, institutional design and program development (Albert et al., 2000). Since the physical environment needs to be considered when developing the levels of intersubjectivity necessary for collaborative activities, we propose that a new thread, Physical Environment, be added to the Web of Intersubjectivity. All of the strands that form the Web of Intersubjectivity support the development, maintenance, and adaptation of collaborative learning groups.

Conclusion

Our study focused on collaborative learning and intersubjective inquiry as a tool for researching collaborative learning. Our study reinforced the findings of an earlier study (Albert et al., 2000) where the threads of shared space, dialogue, time, and power were found to enhance the collaborative process. The additional factors of the critical importance of the problem and influence of the physical environment emerged as key findings in this research.

The Web of Intersubjectivity has demonstrated its value as a metaphor for planning and modifying collaborative learning experiences at the undergraduate and graduate levels. According to Dickmeyer (1989) a metaphor provides an initial way of understanding a complex process. It is a simplification, a first step to understanding. Through continued research and increased understanding, we can shift a metaphor to a model. Models are also simplifications, but have more clearly defined variables that "allow us to manipulate and test changes in a simplified system" (Dickmeyer, 1989, p. 153). In this study, we consciously manipulated specific variables to influence the collaborative process in our classes. We found some variables, such a knowledge, power, and time, had strong effects on other aspects of the process. Because a model is a simplification, it is improvable. In our study, we realized that the environment needed to be incorporated into the model.

The Web of Intersubjectivity is a fluid construct. It has key components, such as relationship, problem, time, shared space, and dialogue that appear to be essential. But it also has components such as power, knowledge, and environment whose importance varies with each setting. This study has shown that the Web of Intersubjectivity is malleable. Strands can be added while others slip into the background without deconstructing the Web itself.

This current study also considered intersubjective inquiry as a tool to research collaborative learning. As with any research method, intersubjective inquiry must produce valid

or truthful knowledge. In qualitative research the terms "trustworthiness" (Lincoln & Guba, 1985) and "authenticity" (Guba & Lincoln, 1994) have been used to describe knowledge. Standards of trustworthiness clearly relate to quantitative standards of internal and external validity, reliability, and generalizability. Authenticity more actively incorporates the participants in the research process. Heron (1996) shifts the standard to a "participative reality" when he states.

> ...knowledge is valid, and the expression of it is true, if it articulates a subjective-objective reality. And what makes a subjective-objective reality a reality, [he] suggest[s], is a congruence between the four ways of knowing, the four forms of knower-known: the experiential knowing of what is present, the presentational knowing of imaginal patterns, the propositional knowing of conceptual constructs, and the practical knowing of skills and competencies. (p. 164)

The cycles of intersubjective inquiry among co-researchers establish this knowledge. Resonance must exist between the levels of knowledge and among the co-researchers.

As Feldman and Atkin (1995) said, the primary goal of educational action research is "to become wiser about educational practice" (p. 130). We used intersubjective inquiry to structure our educational action research because it recognizes that through practice and the resulting experiences, we test the validity of our models, theories, and laws. We applied the Web of Intersubjectivity, a model of collaboration, to our educational practices and reflected on the resonance of our experiences with our propositional knowledge. Depending on the intensity of the resonance, we used our propositional knowledge to more skillfully influence our practice, or we used our experiential knowledge to inform our presentational and propositional knowledge and ultimately our practical knowledge.

Future Considerations

We have been working at a high level of intersubjectivity about our research process and goals when designing the collaborative learning projects. Because we work in different settings, the strength of our intersubjectivity has been increased. We share a similar educational philosophy, but are practicing in different environments. Our fields are grounded in different research and knowledge paradigms, and we educate different types of students. We have challenged ourselves to come to common understandings, to develop heightened levels of intersubjectivity in order to collaborate on our research.

Future research should involve additional researchers in our current as well as other institutions. In addition, the Web of Intersubjectivity should continue to serve as a model to inform the design of collaborative learning situations. Future studies should focus more specifically on the relationship between variables while continuing to identify missing threads.

Such research opportunities would allow for an enhanced understanding of the participative reality relative to the practical knowledge created from the application of the Web of Intersubjectivity.

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